The 52nd International October Conference on Mining and Metallurgy, October 6th – 7th , 2021

THE INFLUENCE OF HIGH COMPACTION PRESSURE ON CORDIERITE-BASED CERAMICS

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Abstract

Cordierite, $2MgO \cdot 2Al_2O_3 \cdot 5SiO_2$ is a high-temperature ceramic material. In order to improve its properties, titanium oxide was added to the starting mixture in an amount of 5%. Mechanical activation of samples was performed in a high-energy ball mill for 10 minutes. The compaction pressure was unusually high, 6 t cm^{-2} (588 MPa) in order to compare to previous research. Cordierite was sintered at the temperature of 1375°C. The phase composition of the activated and sintered samples was analyzed using X-ray diffraction. Scanning electron microscopy was used to analyze the microstructure of both compacted and sintered samples.

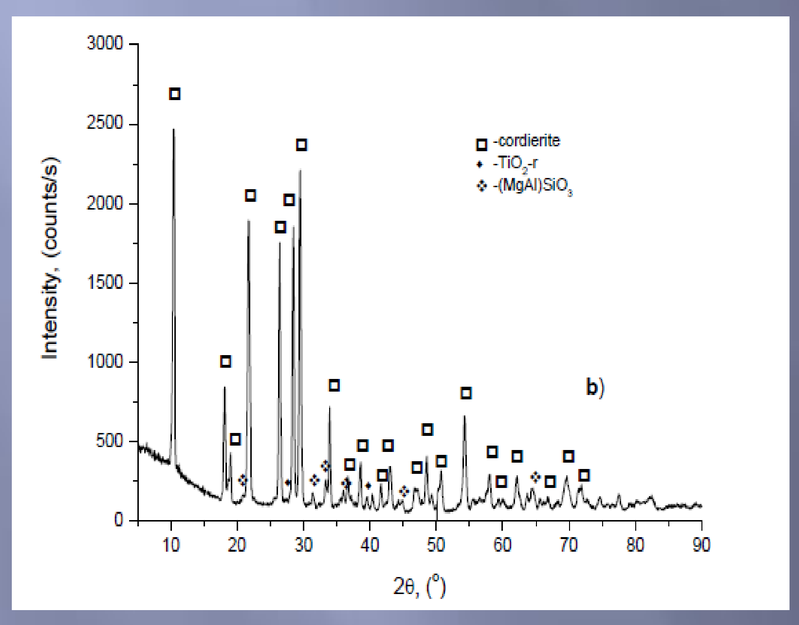

Fig 1. XRD patterns of the samples compacted at 6t/cm^2 pressure and sintered at 1350°C for 4h.

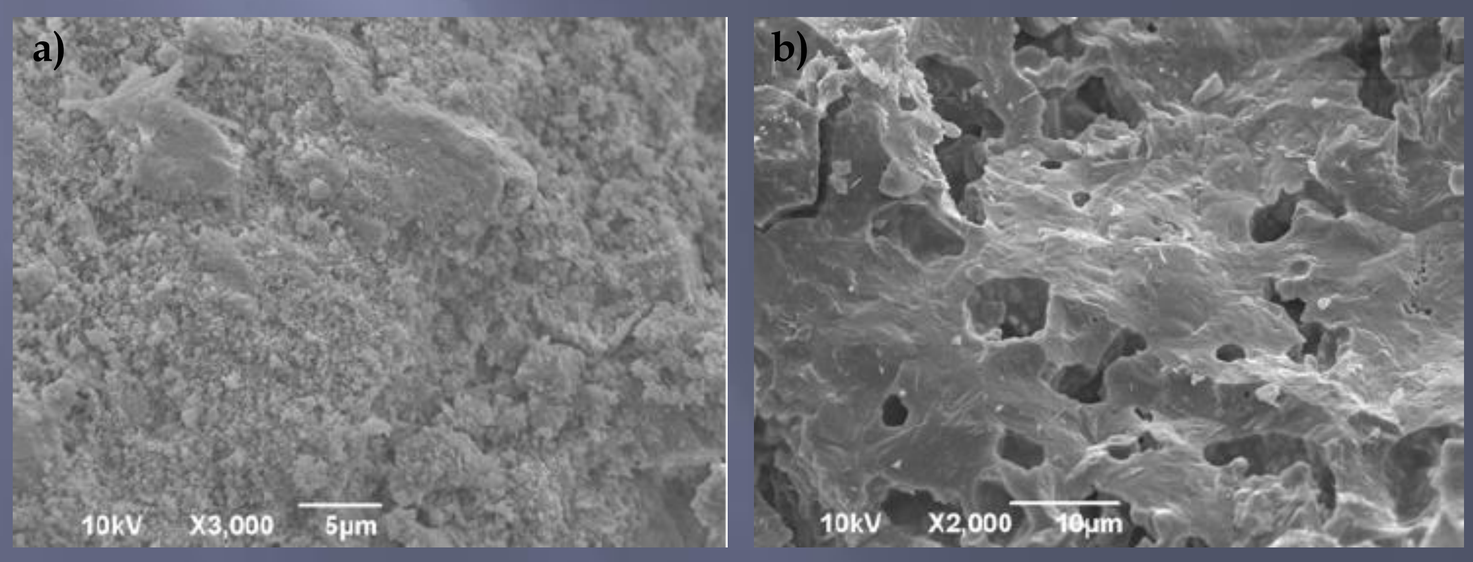

Fig. 2. SEM images of the compacts obtained under 6 t/cm^2 pressure, a) before sintering and b) sintered at 1350°C for 4h.

High pressure has an impact on the final characteristics of the sintered material

- The XRD analysis has shown phase composition in the sintered samples pressed under high pressure of 6 tcm^{-2}. The cordierite phase is the dominant phase; the starting components were completely used in the reaction yielding a new phase in the sample pressed under this high pressure.
- The SEM micrographs clearly indicate a microstructure as follows: with applied high-pressure value of 6 tcm^{-2}, a closed porosity and high-level homogeneous microstructures are obtained

ACKNOWLEDGMENTS
The authors are grateful to the Ministry of Education, Science and Technological Development of the Republic of Serbia for their support in the research whose results are presented in the paper (451-03-9/2021-14/200023 and 451-03-9/2021-14/200026).